Abstract Submitted
for the 4CF13 Meeting of
The American Physical Society

Generation of spin currents with light and spin Seebeck effect[1]
DAVID ELLSWORTH, LEI LU, MINGZHONG WU, Colorado State Univ — The spin Seebeck effect (SSE) refers to the generation of a spin voltage in a material in the presence of a thermal gradient. This presentation reports on the use of light to induce the SSE. Experiments used a tri-layered sample that consisted of a 5.9-μm-thick yttrium iron garnet (YIG) film grown on a 0.5-mm-thick gadolinium gallium garnet substrate and capped with a 3.8-nm-thick Pt layer. The sample sat on an aluminum heat sink and was exposed to the light from a 100 W incandescent light bulb. A magnetic field was applied in the plane to bias the YIG film. The light produces a thermal gradient across the sample thickness which produces, through the SSE, a spin current that flows from the YIG/Pt interface into the Pt layer. Via the inverse spin Hall effect, the spin current generates an electric voltage across one of the lateral dimensions of the Pt layer. It was found that the voltage varied with time in sync with the temperature gradient. The voltage amplitude had linear dependence on light intensity and showed sinusoidal dependence when the magnetic field was rotated in the plane for one cycle. The voltage changed its sign as the field switched its polarity.

[1]This work was supported in part by U.S. National Science Foundation (No. ECCS-1231598), the U.S. Army Research Office (No. W911NF-12-1-0518, No. W911NF-11-C-0075), and the U.S. National Institute of Standards and Technology (No. 60NANB10D011).

David Ellsworth
Colorado State Univ

Date submitted: 20 Sep 2013 Electronic form version 1.4